

# Clutch Parameters of *Storeria dekayi* Holbrook (Serpentes: Colubridae) from Southcentral Florida

WALTER E. MESHAKA, JR.

*Archbold Biological Station*  
*P.O. Box 2057*  
*Lake Placid, Florida 33852*

**ABSTRACT**—I examined clutch characteristics from a series of *Storeria dekayi* collected in southcentral Florida from March to July 1990. Clutch size averaged 8.5 and was not significantly associated with female body size. The small clutch sizes of this sample conformed to predictions of clutch size reduction in southern populations. However, the data did not support predictions of increased clutch number in southern populations. Possibly, high relative clutch mass detected in this population and an unaltered breeding season hinder production of more than one clutch annually.

Two latitudinal clines in snakes have been proposed that predict differences in clutch size and number along a geographic gradient. The first predicts a decrease in clutch size from north to south (Fitch 1985). The second hypothesis predicts an increase in clutch number at lower latitudes concomitant with a longer reproductive season (Fitch 1970).

The reproductive biology of *Storeria dekayi* in Florida is poorly known; however, parturition dates of this species are available from Florida (Iverson 1978), and they do not differ from parturition dates in more northern populations (Fitch 1970). Iverson's (1978) data do not support the prediction of a latitudinal cline in clutch number for this species.

With few exceptions, Iverson (1978) found that most Florida snake species he examined did not conform to the prediction of multiple clutches in southern populations. In this article I present additional reproductive data for female *S. dekayi* from south Florida which permit testing Fitch's (1985) hypothesis of clutch size reduction in southern populations and further evaluation of the likelihood of multiple clutch production in this species at the southern limit of its geographic range (Fitch 1970).

## METHODS

Snakes were collected from 1830 to 2200 hours from a paved road (C-621) near Lake Placid, Highlands County, Florida, during March-July 1990. All snakes observed were collected, frozen within 3 hours of capture, and dissected the next day.

Condition of follicles was staged according to Kofron (1979). I estimated clutch size by counting enlarged follicles or conceptuses. Relative clutch mass, the quotient of clutch mass divided by the sum of the clutch mass and the female body mass (Seigel and Fitch 1984), was measured in females with fully developed conceptuses. All specimens are located in the Archbold Biological Station vertebrate collection.

### RESULTS AND DISCUSSION

Eighteen snakes (3 males, 15 females) were collected during 22.5 hours of searching. Snout-vent lengths (SVL) of males collected in March ( $n = 1$ ) and June ( $n = 2$ ) were 23.0, 25.0, and 27.5 mm, respectively. Snout-vent lengths and clutch parameters of females are summarized in Table 1. Estimated clutch size was not significantly correlated with SVL ( $r = 0.31$ ,  $P > 0.05$ ).

Table 1. Snout-vent lengths (SVL) and clutch parameters of *Storeria dekayi* collected from one location in Highlands County, Florida, 1990.

Date	Female SVL	Clutch Size	Relative Clutch Mass	Neonate SVL (cm)
17 March	24.6	7		
17 March	21.8	7		
17 May	26.0	12	0.400	6.3 + 0.306
25 May	28.0	spent		
29 May	24.3	8	0.361	
31 May <sup>1</sup>	25.3	9		7.7 + 0.500
8 June	26.0	spent		
8 June	29.0	11		
14 June	28.0	10	0.340	8.4 + 0.097
21 June	27.5	5		
21 June	27.5	10		
24 June	26.5	8		
3 July	33.0	9		
23 July	26.0	5		
24 July	28.5	10		
31 July	25.3	9		
$\bar{x}$	26.8	8.5	0.367	
SD	2.55	2.15	0.030	
Range	21.8–33.0	5–12	0.340–0.400	
n	15	13	3	

<sup>1</sup> Denotes a specimen collected in 1992 from the same site. Data not analyzed with 1990 sample.

Mean clutch size (8.5) was similar to that found in Everglades National Park by Dalrymple et al. (1992), and the samples from both regions had a female - biased sex ratio. Female *S. dekayi* from Iverson's (1978) northern Florida sample had smaller SVL than females from my study ( $t = 3.681$ ;  $df = 10$ ;  $P < 0.004$ ), but the two samples did not differ significantly in clutch size. Although both mean female SVL (27.3 mm) and clutch size (14.0) from *S. dekayi* near Lake Erie (King 1993) were significantly larger than those of my study ( $t = 2.12$   $P = 0.05$ ; and  $t = 7.53$   $P < 0.00$ , respectively;  $df = 38$ ), the difference in SVL was marginal. Mean clutch sizes, 14.9 in Louisiana (Kofron 1979) and 14 in New York (Clausen 1936), are also substantially larger than those for Florida, which supports Fitch's (1985) prediction of smaller clutch sizes in southern latitudes.

A review of relative clutch mass in snakes indicates that there is a reduction in relative clutch mass among viviparous forms that may reduce the risk of mortality in gravid females (Seigel and Fitch 1984). The cost of lowering relative clutch mass is a reduction of clutch size, offspring size, or both. Resources could limit production of more than one clutch (Bull and Shine 1979), but a large clutch could compensate for a single brood (Seigel and Fitch 1984). Mean relative clutch mass in *S. dekayi* from southern Florida was high (0.367) and similar to that (0.372) recorded for *S. dekayi* from Maryland (Jones 1976). A high relative clutch mass in southern Florida *S. dekayi* may compensate for a single small clutch produced each season.

In northern Florida, females with fully developed conceptuses were recorded from July to September (Iverson 1978). In southern Florida, the earliest date was May (Iverson 1978, my study), and in Everglades National Park captive females gave birth from June to September (Dalrymple et al. 1992). Collectively, the breeding season of Florida populations of *S. dekayi* (Iverson 1978, Dalrymple et al. 1992, my study) falls within the range of other populations (Fitch 1970, Kofron 1979). Further, my results did not indicate a reduction of relative clutch mass, which could facilitate multiple clutch production, in southern Florida *S. dekayi*.

### CONCLUSIONS

Clutch frequency of this species in southern Florida has not been determined to date, and multiple clutch production, even if infrequent, has not been excluded. An annual sample of specimens or mark-recapture will best answer this question. Results of my study do not support Fitch's (1970) prediction of multiple clutch production by *S. dekayi* in the southern part of the range.

However, clutch sizes from south Florida *S. dekayi* were smaller than northern populations as predicted by Fitch (1985) and unaffected by female body size. Possibly, a high relative clutch mass and an unaltered breeding season limit this population to one brood annually.

**ACKNOWLEDGMENTS**—I would like to thank John W. Fitzpatrick, Station Director, for support for this project at Archbold Biological Station. Betty S. Ferster assisted in collecting snakes. Henry R. Mushinsky, James N. Layne, and Sam D. Marshall reviewed an earlier version of this manuscript.

#### LITERATURE CITED

- Bull, J. J., and R. Shine. 1979. Iteroparous animals that skip opportunities for reproduction. *American Naturalist* 114:296–303.
- Clausen, H. J. 1936. Observations on the brown snake, *Storeria dekayi* (Holbrook), with special reference to the habits and birth of young. *Copeia* 1936:98–102.
- Dalrymple, G. H., T. M. Steiner, R. J. Nodell, and F. S. Bernardino, Jr. 1992. Seasonal activity of the snakes of Long Pine Key, Everglades National Park. *Copeia* 1991:294–302.
- Fitch, H. S. 1970. Reproductive cycles of lizards and snakes. University of Kansas Museum of Natural History Miscellaneous Publication. 42:1–247.
- Fitch, H. S. 1985. Variation in clutch and litter size in new world reptiles. University of Kansas Museum of Natural History Miscellaneous Publication. 76:1–76.
- Iverson, J. B. 1979. Reproductive notes on south Florida snakes. *Florida Scientist* 41:201–207.
- Jones, L. 1976. A large brood for a Maryland *Storeria dekayi dekayi*. *Bulletin of the Maryland Herpetology Society* 12:102–103.
- King, R. B. 1993. Determinants in offspring number and size in the brown snake, *Storeria dekayi*. *Journal of Herpetology* 27(2):175–185.
- Kofron, C. P. 1979. Female reproductive biology of the brown snake, *Storeria dekayi*, in Louisiana. *Copeia* 1979:463–466.
- Seigel, R. A., and H. S. Fitch. 1984. Ecological patterns of relative clutch mass in snakes. *Oecologia* 61:293–301.

Received 15 June 1993

Accepted 15 September 1993